10/22/02 - 03386

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October 22, 2002

Commander, Atlantic Division
Naval Facilities Engineering Command
1510 Gilbert Street (Bldg. N-26)
Norfolk, Virginia 23511-2699

Attn: Mr. Kirk Stevens, P.E.
Navy Technical Representative
Code EV23-KAS

Re: Contract N62470-95-D-6007
Navy CLEAN II, District III
Contract Task Order (CTO) 0219
Final Engineering Evaluation/Cost Analysis (EE/CA)
Operable Unit No. 6, Sites 36, 43, 44 and 54
Marine Corps Base, Camp Lejeune, North Carolina

Dear Mr. Stevens:

This letter report presents the Final Engineering Evaluation/Cost Analysis (EE/CA) for non-time-critical removal actions (NTCRAs) being considered for Sites 36 and 43 at Operable Unit (OU) No. 6, Marine Corps Base, Camp Lejeune, North Carolina. An EE/CA was prepared concurrently with the Record of Decision (ROD) in order to expedite the removal action of contaminated soil as recommended in the Final Feasibility Study (FS) for OU No. 6.

OU No. 6 is comprised of four sites; 36, 43, 44, and 54. This report presents the location-specific NTCRA recommended for two of these Sites; 36 and 43. Soil is not a media of concern at Site 44[1] based upon results of the human health and ecological risk assessments, therefore a remedial response is not necessary. As for Site 54, contaminated soil was removed in April, 2001 by the Remedial Action Contractor (RAC). Based upon the work completed to date, further actions are not warranted at Sites 44 and 54. As such, these two sites will not be discussed further in this EE/CA.

[1] Baker, 2002. "Final Feasibility Study for Operable Unit No. 6, Sites 36, 43, 44 and 54", Baker Environmental, Inc. July 23, 2002.

As required by Section 300.415(b)(4)(i) of the National Contingency Plan (NCP), an EE/CA must be completed for all NTCRAs. The goals of the EE/CA are to identify the objectives of the proposed removal action and to analyze the effectiveness, implementability and cost of various alternatives that may satisfy the objectives. Thus, an EE/CA serves an analogous function to, but is more streamlined than, the RI/FS conducted for remedial actions. This EE/CA was prepared in letter format at the request of the Partnering Team. The document is designed to be concise and specific to the subject sites, while following guidance contained in the EPA directive[2].

EE/CA Administrative Requirements

The EE/CA is part of the administrative record file and is subject to the public comment and comment response requirements of the administrative record. A public notice describing the EE/CA is required to be published in a major local newspaper. For NTCRAs, the NCP requires a 30-day public comment period on the EE/CA. Soliciting and responding to public comments on the administrative record, including the EE/CA, is required by Section 300.820(a) of the NCP.

NTCRAs funded by the USEPA have a $2 million and a 12-month statutory limit pursuant to Section 104(c)(1) of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). However, because removal actions at MCB, Camp Lejeune are not funded by the USEPA, these statutory limits do not apply.

Site Background and History

Site 36

Site 36 is located approximately 1,000 feet east of Camp Geiger and 500 feet west of the New River, adjacent to the Camp Geiger Sewage Treatment Plant. Camp Geiger is situated directly north of Marine Corps Air Station (MCAS), New River, and approximately 3 miles southwest of Jacksonville, North Carolina (see Figure 1).

[2] USEPA, 1993. "Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA", Office of Emergency and Remedial Response, Washington, D.C., August 1993.

Figure 2 shows the features of Site 36. The site encompasses nearly 20 acres and is comprised primarily of open fields and wooded areas. A gravel road bisects the site and provides access to Jack's Point Recreation Area, located approximately one-quarter mile to the east. The site is bordered to the north and east by Brinson Creek and a wooded area, to the south by an unnamed tributary to Brinson Creek, and to the west by an improved (i.e., coarse gravel) road. Further to the west of the improved road lies an abandoned railroad right-of-way, once part of the Seaboard Coastline Railroad.

Site 36 reportedly has been used for the disposal of municipal wastes and mixed industrial wastes including trash, waste oils, solvents and hydraulic fluids that were generated at MCAS, New River. The dump was active from the late 1940s to the late 1950s. Most of the material was burned and buried; however, some unburned material was also buried. Reportedly, less than five percent of all waste hydrocarbon material generated at MCAS, New River was disposed at Site 36. The remaining waste oil was reportedly used for dust control on roads or discharged directly to storm drains.

Parts of the site have been changed due to the construction of the North Carolina Department of Transportation (NCDOT) Route 17 by-pass project. Several of the gravel roads that ran through the site have been widened and the elevation raised, serving as the subgrade for the North Carolina Department of Transportation (NCDOT) Route 17 by-pass. The NCDOT Route 17 by-pass construction extends outside the boundaries of the Site 36 study area and lies to the west of the site.

Site 43

Site 43 is comprised of approximately 11 acres and is located within the operations area of MCAS, New River, two miles west of the New River. Vehicular access to the site is via Agan Street from Curtis Road.

Figure 3 shows the site features for Site 43. The site is located at the northern terminus of Agan Street, adjacent to an abandoned wastewater treatment plant. The site is bordered to the north by Edwards Creek, to the east and south by Strawhorn Creek, and to the west by Agan Street and the former sewage disposal facility. Strawhorn Creek discharges into Edwards Creek at Site 43. Edwards Creek then discharges into the New River approximately 2,000 feet north of the study area, near Site 36.

Much of this site is heavily vegetated with dense shrubs and trees greater than three inches in diameter. Marsh areas prone to flooding surround both the Strawhorn and Edwards Creeks. An improved gravel loop road provides access to the main portion of the study area; other, smaller unimproved paths extend outward from the gravel loop road.

The Agan Street Dump reportedly received mainly inert material such as construction debris (i.e., fiberglass and lumber) and trash. Sludge from the former sewage disposal facility, located adjacent to the study area, was also dumped at Site 43. The time period during which disposal activities occurred, however, is not known.

Previous Removal Actions

Site 36

Based on the results of the 1995 Final RI, a TCRA was performed at Site 36 in July 1997 by the RAC. This included the excavation of approximately 92 tons of TSCA regulated polychlorinated biphenyl (PCB) contaminated soil and approximately 148 tons of mixed CERCLA regulated and PCB-contaminated soil from Site 36 (Figure 4). The contaminated soil was disposed of in an appropriate treatment/disposal facility.

Upon completion of excavation activities, confirmatory sampling was performed demonstrating that soils remaining on site exhibited concentrations of PCBs below the action levels specified in the work plans (10 milligrams per kilogram [mg/kg]) for PCBs. Site restoration included the placement of clean backfill from an off-site borrow pit, the replacement of gravel on the gravel road and revegetation.

Site 43

During 1995, a TCRA was performed at Site 43 by the RAC to remove surficial metallic debris found during the Site Inspection (SI). Project activities involved the removal of all surficial metallic debris, including empty drums, various scrap metals and an old tank vehicle. Additionally, the RAC collected, sampled and shipped off-site four drums (1,400 lbs.) of hazardous materials for disposal. Site restoration included regrading the site due to the removal of the old tank vehicle and other debris.

Nature and Extent of Contamination

Site 36

Based on site investigations conducted to date, including the Remedial Investigation (Baker, 1995), soil is the environmental media of concern at Site 36 for this EE/CA. Soil contaminants of concern to be addressed with a NTCRA include polyaromatic hydrocarbons (PAHs) and pesticides. The final soil contaminants of concern (COCs) for the proposed residential land use NTCRA are summarized on Table 1. For this removal, United States Environmental Protection Agency (USEPA) Region IX Residential Preliminary Remediation Goals (PRGs) were used for estimating the volumes of contaminated soil and costs in the Final FS for OU 6. Although lead is a COC for this site, soil with lead contamination will be addressed with institutional controls as opposed to a NTCRA.

Site 43

Based on site investigations conducted to date, including the Remedial Investigation, soil is the environmental media of concern at Site 43 for this EE/CA. Soil contaminants of concern to be addressed with a NTCRA include PAHs. The final soil COCs for the proposed residential land use NTCRA are summarized on Table 2. For this removal, USEPA Region IX Residential PRGs were used for estimating the volumes of contaminated soil and costs in the Final FS for OU 6.

Analytical Data

Site 36

A summary of the analytical data collected during the Remedial Investigation at Site 36 is presented on Table 3. Localized areas of contamination at Site 36 were screened against residential criteria for PAHs and pesticides. The soil sample locations containing exceedances of PAH and pesticide criteria are shown on Figure 5.

Site 43

A summary of the analytical data collected during the Remedial Investigation at Site 43 is presented on Table 4. Localized areas of contamination at Site 43 were screened against residential criteria for PAHs. The soil sample locations containing exceedances of PAH screening criteria are shown on Figure 6.

Risk Assessment Summary

Site 36

- For the current exposure scenario, fishermen exhibited a potential risk for ingestion of fish and crab tissue from Brinson Creek. Levels of arsenic and mercury in fish tissue and arsenic and lead in crab tissue contributed to this risk.

- There is also an unacceptable noncarcinogenic risk for future child residents exposed to iron in subsurface soil

Site 43

- There are no unacceptable human health risks for current receptors at Site 43

- No carcinogenic risks were identified for future adult and child residents or construction workers

Removal Action Objectives

Removal action objectives are medium-specific or site-specific goals established for protecting human health and the environment. At OU No. 6, the environmental media to be addressed by removal actions proposed in this EE/CA include contaminated soil in localized areas of Site 36 and Site 43. The removal action objective for OU No. 6 is to remove or mitigate potential exposure to PAH (Sites 36 and 43) and pesticide (Site 36 only) contaminated surface and subsurface soil that contain contaminants related to past site practices.

Determination of Removal Action Scope

The selected removal actions are intended to be the final corrective actions to be implemented at OU No. 6 to achieve the identified removal action objective. The removal actions selected in this EE/CA are intended to remove soils in areas with elevated PAH and pesticide (Site 36 only) contamination. For this removal, USEPA Region IX PRGs were used for estimating the volumes of contaminated soil and costs in the Final FS for OU 6.

Determination of Removal Action Schedule

Construction activities for the selected removal actions are anticipated to require less than 12 months. Factors that may affect the removal action schedule relate to administrative requirements and seasonal restrictions. For example, inclement weather (storms or hurricanes) can delay execution of soil removal remedial actions.

Summary of Soil Removal Action Alternatives (RAAs)

A wide range of potential RAAs are available for Sites 36 and 43 that represent various levels of response actions, land use controls and remediation costs. The following removal alternatives are presented to address PAH and pesticide contamination in soil at OU No. 6. Table 5 provides a summary of the soil RAAs for OU No. 6.

Site 36

36S RAA 1: No Action $0

- No remedial actions taken

36S RAA 2: Capping and Institutional Controls for Lead Contaminated Areas $188,000

- Localized impacted PAH and pesticide soil areas capped
- Site is graded and revegetated
- Areas exceeding USEPA residential action level for lead (400 ppm) are surveyed and delineated

- Land use controls for intrusive activity within the capped areas and future use restrictions for lead contaminated areas are imposed at Site 36

36S RAA 3: Excavation and Off-Site Disposal and Institutional Controls for Lead Contaminated Areas $201,000

- Localized impacted PAH and pesticide soil areas excavated
- Excavated soil is disposed in the Base landfill
- Site restored to pre-excavation conditions
- Areas exceeding USEPA residential action level for lead (400 ppm) are surveyed and delineated
- Land use controls future use restrictions for lead contaminated areas are imposed at Site 36

Site 43

43S RAA 1: No Action $0

- No physical remedial actions implemented

43S RAA 2: Capping and Institutional Controls $170,000

- Localized impacted PAH areas capped
- Site is graded and revegetated
- Intrusive activity restrictions

43S RAA 3: Excavation and Off-Site Disposal and Institutional Controls $119,000

- Localized impacted PAH areas excavated
- Excavated soil is disposed in the Base landfill
- Site restored to pre-excavation conditions
- Intrusive activity restrictions

Comparative Analysis of Soil Removal Action Alternatives

The following presents a comparative analysis of the RAAs presented for soil at OU No. 6. The purpose of the comparative analysis is to identify the relative advantages and disadvantages of each RAA.

Site 36

Overall Protection of Human Health and the Environment

Each alternative will protect human health and the environment with the exception of 36S RAA 1, the no action alternative. 36S RAA 3 is most protective of human health and the environment because in this alternative, areas of elevated PAH and pesticide contaminated soil are removed from the site. 36S RAA 2 offers reduced exposure pathways through capping. Both 36S RAA 2 and 36S RAA 3 control exposure pathways for lead contamination, and accordingly protect human health, through future land use and excavation restrictions. However, no physical means will be used to protect the environment from exposure to lead contamination at Site 36.

Compliance with ARARs

All of the RAAs, except for no action, meet the chemical-specific ARARs and remedial goals for the desired future land use. Location-specific and action-specific ARARs are met as applicable within each RAA.

Long-Term Effectiveness and Permanence

The no action alternative will not be effective over the long term in protecting human health and the environment because the contaminants will remain at the site and will not be contained, removed or treated. 36S RAA 3 will be effective in the long term because PAH and pesticide contamination is removed or controls are in place to protect potential receptors. 36S RAA 2 will be effective in the long term if the soil cover is properly maintained into the future, and land use controls will protect potential receptors. Institutional controls for the lead contaminated areas under 36S RAAs 2 And 3 will be effective if land use restrictions are observed.

Reduction of Toxicity, Mobility, or Volume Through Treatment

The no action alternative will not reduce the toxicity, mobility, or volume of contaminated soil at Site 36. 36S RAA 2 will reduce the mobility of PAH and pesticide contaminants but not the toxicity or volume of

the soil itself. However, because capping will reduce contact with contaminated soil by human and ecological receptors, the potential toxicity will be reduced. 36S RAA 3 will reduce the toxicity, mobility, and volume of contaminants for the desired future land use through removal of contaminants from the site. Institutional controls for the lead contaminated areas under 36S RAA 2 and 36S RAA 3 will not reduce the toxicity, mobility or volume of lead contaminated soil, but would control exposure to lead contaminated soils on site.

Short-Term Effectiveness

The no action alternative is not effective for protecting human health and the environment in the short term. The contaminants will remain in place and will not be disturbed. 36S RAA 3 requires excavation of contaminated soil that could increase the exposure of construction workers and ecological receptors to contaminated soils in the short term. However, exposure to human health and the environment will be minimized by the proper use of personal protective equipment, erosion and sediment control measures, and dust controls. Institutional controls for the lead contaminated areas under 36S RAAs 2 and 3 will be effective for protecting human health against lead exposure as soon as the land use controls are implemented, however, it will not be protective of the environment. It is estimated that all the alternatives can be implemented in less than one year.

Implementability

The no action alternative requires no effort because no changes will be made to affect current site conditions. 36S RAAs 2 and 3 are more difficult to implement and require the mobilization and operation of specialized equipment, and more effort for planning and design. Institutional controls for the lead contaminated areas under 36S RAAs 2 and 3 simply involves the implementation of land use controls and excavation restrictions for lead contaminated soils at the site. Land use controls are required for each alternative except the no action alternative. Excavation restrictions are placed on 36S RAAs 2 and 3.

Cost

Estimated total net present worth cost for each RAA is presented on Table 5.

Site 43

Overall Protection of Human Health and the Environment

Each alternative will protect human health and the environment for the desired future land use with the exception of 43S RAA 1, the no action alternative. 43S RAA 3 is most protective of human health and the environment because in this alternative an area of elevated PAH contaminated soils is removed from the site. 43S RAA 2 offers reduced exposure pathways for residential land uses through capping.

Compliance with ARARs

All of the RAAs, except for no action, meet the chemical-specific ARARs and remedial goals for the desired future land use. Location-specific and action-specific ARARs are met as applicable within each RAA.

Long-Term Effectiveness and Permanence

The no action alternative will not be effective over the long term in protecting human health and the environment because the contaminants will remain at the site and will not be contained, removed or treated. 43S RAA 3 will be most effective in the long term because site contamination is permanently removed from the site. 43S RAA 2, a capping alternative, will be effective in the long term if the soil cover is properly maintained into the future.

Reduction of Toxicity, Mobility, or Volume Through Treatment

The no action alternative will not reduce the toxicity, mobility, or volume of contaminated soil at Site 43. 43S RAA 2 will reduce the mobility of contaminants but not the toxicity or volume of the soil itself. However, because capping will reduce contact with contaminated soil by human and ecological receptors, the potential toxicity will be reduced. 43S RAA 3 will reduce the toxicity, mobility, or volume of contaminants for the desired future land use through removal of contaminants from the site.

Short-Term Effectiveness

The no action alternative is not effective for protecting human health and the environment in the short term. The contaminants will remain in place and will not be disturbed. 43S RAA 3 requires excavation of contaminated soil that could increase the exposure of construction workers and ecological receptors to contaminated soils in the short term. However, exposure to human health and the environment will be minimized by the proper use of personal protective equipment, erosion and sediment control measures, and dust controls. It is estimated that all the alternatives can be implemented is less than one year.

Implementability

The no action alternative requires no effort because no changes will be made to affect current site conditions. 43S RAAs 2 and 3 are more difficult to implement and require the mobilization and operation of specialized equipment, and more effort for planning and design. 43S RAA 2 also will implement excavation restrictions (i.e., intrusive activity controls). This required land use control is easily implemented and will be maintained by the Base through the Base Master Planning Process.

Cost

Estimated total net present worth cost for each RAA is presented on Table 5.

Recommended Removal Action Alternative

Site 36

The preferred remedial action for contaminated soil at Site 36 is:

36S RAA 3: Excavation and Off-Site Disposal and Institutional Controls for Lead Contaminated Areas

- Limited areas of pesticide and PAH contaminated soils will be removed from the site
- Excavation is necessary in four small areas (less than 950 CY) of Site 36

- Identifying intrusive boundaries for lead contaminated soils will be acceptable for reducing exposure pathways to lead at Site 36
- Lead contamination exceeds the EPA action level of 400 ppm mostly in the subsurface soils, therefore it is unlikely that it will migrate by wind or water

Actions to be taken:

- Soil removal and disposal in the Base landfill (Figure 7)
- Confirmatory sampling
- Regrading and revegetation of the site to pre-excavation conditions
- A surveying crew will delineate the lead contaminated areas
- Implement intrusive activity controls and industrial use controls for lead contaminated areas through the LUCIP for Site 36

Site 43

The preferred remedial alternative for soil at Site 43 is:

43S RAA 3: Excavation and Off-Site Disposal

- Limited areas of PAH contaminated soils will be removed from the site
- Excavation in one area (less than 750 CY) of Site 43

Actions to be taken:

- Soil removal and disposal in the Base landfill (areas of proposed excavation shown on Figure 8)
- Confirmatory sampling
- Regrading and revegetation of the site to pre-excavation conditions
- Intrusive activity restrictions because this site is a former disposal area through the LUCIP for Site 43

This EE/CA provides a summary and comparison of alternative removal actions evaluated and the removal action selected for the location-specific NTCRAs for Site 36 and Site 43, as required by the NCP.

Baker appreciates the opportunity to serve LANTDIV on this very important project. Should you have any questions or concerns regarding this report, or if I can be of further assistance on other CTO 0219 issues, please do not hesitate to contact me at 412-269-2033 or rbonelli@mbakercorp.com.

Sincerely,

BAKER ENVIRONMENTAL, INC.

Rich Bonelli
Activity Manager

Attachments

cc: Ms. Beth Collier, Code AQ115 (letter only)
Mr. Rick Raines, MCB, Camp Lejeune (1 copy)
Ms. Gena Townsend, EPA (1 copy)
Mr. David Lown, NC DENR (1 copy)
Ms. Diane Rossi, NC DENR (letter only)
Dr. Charlie Stehman, NC DENR (1 copy)
Mr. Ron Kenyon, Shaw Environmental, Inc. (1 copy)
Mr. Chris Bozzini, CH2M Hill (1 copy)
Mr. Scott Bailey, CH2M Hill (1 copy)

TABLE 1
SITE 36 FINAL SOIL COCs
OPERABLE UNIT NO. 6, SITES 36, 43, 44 and 54
ENGINEERING EVALUATION / COST ANALYSIS, CTO-0219
MCB CAMP LEJEUNE, NORTH CAROLINA

Contaminant
SEMIVOLATILES
Benzo(a)anthracene (PAH)
Benzo(a)pyrene (PAH)
Benzo(b)fluoranthene (PAH)
Dibenz(a,h)anthracene (PAH)
Indeno(1,2,3-cd)pyrene (PAH)
n-Nitro-di-n-propylamine
PESTICIDES/PCBs
4-4'-DDE
4-4'-DDT
Dieldrin
gamma-Chlordane
Heptachlor epoxide
METALS
Lead

Notes:

The PRGs were used to estimate the approximate areas and depth of the removal actions, and were used for cost estimating purposes. The actual volumes proposed for removal will be determined in the field during the remedial action. For lead, the EPA OSWER Action level was used to establish the institutional control boundaries.

TABLE 2
SITE 43 FINAL SOIL COCs
OPERABLE UNIT NO. 6, SITES 36, 43, 44 and 54
ENGINEERING EVALUATION / COST ANALYSIS, CTO-0219
MCB CAMP LEJEUNE, NORTH CAROLINA

Contaminant
SEMIVOLATILES)
Benzo(a)anthracene (PAH)
Benzo(a)pyrene (PAH)
Benzo(b)fluoranthene (PAH)
Benzo(k)fluoranthene (PAH)
Dibenz(a,h)anthracene (PAH)
Indeno(1,2,3-cd)pyrene (PAH)

Notes:
The PRGs were used to estimate the approximate areas and depth of the removal actions, and were used for cost estimating purposes. The actual volumes proposed for removal will be determined in the field during the remedial action.

TABLE 3
REMEDIAL INVESTIGATION RESULTS FOR SITE 36
OPERABLE UNIT NO. 6, SITES 36, 43, 44 and 54
ENGINEERING EVALUATION / COST ANALYSIS, CTO-0219
MCB CAMP LEJEUNE, NORTH CAROLINA

Media	Fraction	Detected Contaminants	Screening Criteria [5]	Site Contamination		Maximum Location	Detection Frequency	Distribution
				Min.	Max.			
Surface Soil	Volatiles	Trichloroethene	2,800	4	4	FDA-SB03	1/61	eastern, former disposal area
		Tetrachloroethene	5,700	2	3	36-GW12	3/61	northern, ground scar area
		Toluene	520,000	8	98	OF-SB01	4/61	south central, open field
		Styrene	1,700,000	39	39	GS-SB03	1/61	northern, ground scar area
		Xylene (total)	210,000	7	7	OF-SB06B	1/61	south central, open field
	Semivolatiles	n-Nitro-di-n-propylamine	69	320	320	DAB-SB03	1/57	southeastern, drum area
		Naphthalene (PAH)	56,000	48	120	OF-SB04	2/57	1 south central, 1 western
		2-Methylnapthalene	1,600,000	54	82	OA-SB01A	2/57	1 south central, 1 western
		Acenaphthene (PAH)	3,700,000	330	330	OF-SB04	1/57	south central, open field
		Dibenzofuran	290,000	150	150	OF-SB04	1/57	south central, open field
		Fluorene (PAH)	2,600,000	200	200	OF-SB04	1/57	south central, open field
		Phenanthrene (PAH)	NA	59	2,500	OF-SB04	4/57	scattered
		Anthracene (PAH)	22,000,000	780	780	OF-SB04	1/57	south central, open field
		Carbazole	NA	240	240	OF-SB04	1/57	south central, open field
		Fluoranthene (PAH)	2,300,000	54	5,500	OF-SB04	5/57	4 southeastern, drum area
		Pyrene (PAH)	2,300,000	41	11,000	OF-SB04	8/57	5 southeastern, drum area
		Butylbenzylphthalate	12,000,000	51	290	OA-SB03	3/57	western
		B(a)anthracene (PAH)	620	46	3,900	OF-SB04	2/57	1 south central, 1 southeastern
		Chrysene (PAH)	62,000	51	4,600	OF-SB04	5/57	3 southeastern, drum area
		B(b)fluoranthene (PAH)	620	51	3,600	OF-SB04	3/57	scattered
		B(k)fluoranthene (PAH)	6,200	39	1,500	OF-SB04	2/57	1 south central, 1 southeastern
		Benzo(a)pyrene (PAH)	62	40	3,300	OF-SB04	2/57	1 south central, 1 western
		I(1,2,3-cd)pyrene (PAH)	620	46	2,700	OF-SB04	3/57	scattered
		D(a,h)anthracene (PAH)	62	720	720	OF-SB04	1/57	south central, open field
		B(g,h,i)perylene (PAH)	NA	2,400	2,400	OF-SB04	1/57	south central, open field
	Pesticides	gamma-BHC (Lindane)	440	4	4	OF-SB06D	1/57	south central, open field
		Aldrin	29	5	5.1	OF-SB03	3/57	1 open field, 2 adjacent toSB01
		Heptachlor	110	1.9	1.9	FCA-SB12	1/57	southwestern, former cleared area
		Heptachlor epoxide	53	2	67	OA-SB01I	10/57	scattered, 3 adjacent to SB01
		Endosulfan I	370000	8.3	36	OA-SB01E	3/57	all adjacent to SB01
		Dieldrin	30	2	16,000	OF-SB03	21/57	scattered
		4-4'-DDE	1700	2.2	2,600	OA-SB01A	49/57	widely scattered, prevalent
		Endrin	18000	9.9	9.9	OA-SB08	1/57	eastern, former disposal area
		4-4'-DDD	2400	2.8	550	OA-SB01A	37/57	widely scattered, prevalent
		Endosulfan Sulfate	NA	2.5	4.2	OF-SB06	2/57	1 south central, 1 western
		4-4'-DDT	1700	1.8	12,000	OA-SB01A	48/57	widely scattered, prevalent
		Endrin Ketone	NA	15	15	OF-SB03	1/57	south central, open field
		Endrin aldehyde	NA	12	12	OF-SB02	1/57	south central, open field
		alpha-Chlordane	1600	1.2	980	OA-SB05	15/57	scattered
		gamma-Chlordane	1600	1.2	840	OA-SB05	10/57	scattered
	PCBs (1)	Aroclor 1248	220	68	24,000	OA-SB01I	9/57	western, surrounding SB01
		Aroclor 1254	220	92	530	OA-SB01	3/57	western, surrounding SB01
	Metals	Aluminum	76,000	1,010	17,600	FCA-SB09	52/52	scattered
		Antimony	31	3.3	31.7	OA-SB08	7/46	scattered
		Arsenic	22	0.39	10.4	OA-SB08	43/52	scattered

TABLE 3 (continued)
REMEDIAL INVESTIGATION RESULTS FOR SITE 36
OPERABLE UNIT NO. 6, SITES 36, 43, 44 and 54
ENGINEERING EVALUATION / COST ANALYSIS, CTO-0219
MCB CAMP LEJEUNE, NORTH CAROLINA

Media	Fraction	Detected Contaminants	Screening Criteria [5]	Site Contamination		Maximum Location	Detection Frequency	Distribution
				Min.	Max.			
Surface Soil (Continued)	Metals (Continued)	Barium	5,400	4.5	141	OA-SB08	51/52	scattered
		Beryllium	150	0.18	0.18	FCA-SB10	1/52	1 detection southwest
		Cadmium	37	0.7	6.3	OA-SB08	8/52	scattered
		Calcium	NA	106	103,000	OF-SB06	51/52	scattered
		Chromium	210	1.6	51.6	OA-SB08	52/52	scattered
		Cobalt	4,700	0.88	9	OA-SB08	10/52	scattered
		Copper	2,900	0.6	445	OA-SB08	39/52	scattered
		Iron	23,000	863	86,200	OA-SB08	52/52	scattered
		Lead	400	4.3	836	OA-SB08	48/52	scattered
		Magnesium	NA	52	1,020	DAD-SB01	52/52	scattered
		Manganese	1,800	2.1	940	OA-SB08	52/52	scattered
		Mercury	23	0.1	2.4	OA-SB05	18/52	scattered
		Nickel	1,600	1	48.3	OA-SB08	26/52	scattered
		Potassium	NA	33.7	676	FCA-SB05	32/52	scattered
		Selenium	390	0.32	0.53	36-SB06D	12/52	scattered
		Silver	390,000	0.6	12	OF-SB04	8/48	3 south central
		Sodium	NA	9.6	358	DAD-SB01	31/52	scattered
		Vanadium	550	2.9	46	OA-SB08	50/52	scattered
		Zinc	23,000	2.1	1,320	OA-SB08	50/52	scattered
Subsurface Soil	Volatiles	Acetone	1,600,000	12	480	GS-SB03	8/62	1 exceeds blank, ground scar area
		1,2-Dichloroethene (total)	63,000	4	4	OA-SB01	1/62	western
		Trichloroethene	2,800	3	5	FDA-SB01	3/62	2 eastern, 1 western
		Benzene	670	3	3	FDA-SB01	1/62	eastern, former disposal area
		Toluene	520,000	5	17	OF-SB06	5/62	south central, open field
		Xylene (total)	210,000	2	6	FDA-SB06	8/62	scattered
	Semivolatiles	1,4-Dichlorobenzene	3,400	97	97	DAB-SB02	1/57	southeastern, drum area
		2-Methylphenol	3,100,000	510	510	DAB-SB01	1/58	southeastern, drum area
		4-Methylphenol	310,000	43	43	DAB-SB01	1/58	southeastern, drum area
		Isophorone	510,000	2,100	2,100	DAB-SB01	1/58	southeastern, drum area
		Naphthalene (PAH)	56,000	41	41	OA-SB01A	1/57	western
		2-Methylnaphthalene	1,600,000	65	85	FDA-SB02	2/57	1 eastern, 1 western
		Phenanthrene (PAH)	NA	48	190	OA-SB07	3/57	scattered
		Di-n-butylphtalate	6,100,000	56	56	OA-SB01	1/58	western
		Fluoranthene (PAH)	2,300,000	130	320	OA-SB07	3/57	2 eastern, 1 south central
		Pyrene (PAH)	2,300,000	59	320	OA-SB07	5/57	scattered
		Butylbenzylphtalate	12,000,000	42	170	OA-SB03	3/57	scattered
		B(a)anthracene (PAH)	620	69	140	OA-SB07	3/57	scattered
		Chrysene (PAH)	62,000	41	200	OA-SB07	5/57	3 eastern, former disposal area
		B(b)fluoranthene (PAH)	620	44	170	OA-SB07	5/57	4 eastern, 1 south central
	Semivolatiles	B(k)fluoranthene (PAH)	6,200	42	68	OA-SB07	3/57	eastern, former disposal area
		Benzo(a)pyrene (PAH)	62	72	450	GS-SB03	4/57	3 eastern, 1 northern
		I(1,2,3-cd)pyrene (PAH)	620	48	110	OA-SB07	3/57	eastern, former disposal area
		B(g,h,i)perylene (PAH)	NA	42	89	OA-SB07	2/57	eastern, former disposal area
	Pesticides	gamma-BHC (Lindane)	440	4	4	OF-SB06D	1/56	open field
		Aldrin	29	1.5	16	36-GW11	5/56	3 southeastern, 2 eastern

TABLE 3 (continued)
REMEDIAL INVESTIGATION RESULTS FOR SITE 36
OPERABLE UNIT NO. 6, SITES 36, 43, 44 and 54
ENGINEERING EVALUATION / COST ANALYSIS, CTO-0219
MCB CAMP LEJEUNE, NORTH CAROLINA

Media	Fraction	Detected Contaminants	Screening Criteria [5]	Site Contamination		Maximum Location	Detection Frequency	Distribution
				Min.	Max.			
Subsurface Soil (Continued)	Pesticides (continued)	Heptachlor Epoxide	53	3.4	14	36-GW11	3/56	3 eastern, former disposal area
		Dieldrin	30	2.2	1,200	FDA-SB05	17/56	scattered
		4,4'-DDE	1,700	2.3	1,700	OA-SB01A	29/56	widely scattered, prevalent
		Endrin	18,000	2.4	5	OF-SB06B	5/56	scattered
		Endosulfan II	NA	2.0	2.0	OF-SB06B	1/56	south central, open field
		4,4'-DDD	2,400	2.3	1,300	FDA-SB05	30/56	widely scattered, prevalent
		4,4'-DDT	1,700	2.8	3,100	OA-SB01A	28/56	widely scattered, prevalent
		Endrin Aldehyde	NA	3.5	32	FDA-SB05	3/56	2 south central, 1 eastern
		alpha-Chlordane	1,600	1.6	750	36-GW11	12/56	primarily eastern
		gamma-Chlordane	1,600	2.3	770	36-GW11	9/56	primarily eastern
	PCBs (1)	Aroclor 1248	220	19	850	OA-SB01	5/56	western, adjacent to SB01
	Metals	Aluminum	76,000	752	19,700	FDA-SB05	51/51	scattered
		Antimony	31	4.9	21.6	36-GW11	7/44	eastern
		Arsenic	22	0.2	25.9	FDA-SB01	41/51	eastern and central
		Barium	5,400	2	475	36-GW11	50/51	scattered
		Beryllium	150	0.17	0.18	FCA-SB10	2/51	southwestern
		Cadmium	37	0.7	42.8	36-GW11	11/51	eastern and central
		Calcium	NA	15	46,300	OF-SB06B	49/51	scattered
		Chromium	210	1.4	71.9	36-GW11	50/51	eastern and central
		Cobalt	4,700	0.48	9.4	OA-SB07	16/51	scattered
		Copper	2,900	0.5	1,320	OF-SB06B	31/51	scattered
		Iron	23,000	408	132,000	36-GW11	51/51	scattered
		Lead	400	1.2	2,680	OA-SB07	50/51	scattered
		Magnesium	NA	20.2	2,700	36-GW11	51/51	scattered
		Manganese	1,800	0.85	1,260	FDA-SB01	47/51	scattered
		Mercury	23	0.12	3.9	OA-SB07	13/51	east/southeastern
		Nickel	1,600	1.1	72.1	DAD-SB02	24/51	scattered
		Potassium	NA	47.2	1,640	FDA-SB06	32/51	scattered
		Selenium	390,000	0.4	1.2	OF-SB06	4/51	southcentral
		Silver	390	0.55	0.89	36-GW11	3/48	east central
		Sodium	NA	5.2	501	FDA-SB06	34/51	scattered
		Vanadium	550	1.6	52.6	OF-SB06	49/51	scattered
		Zinc	23,000	0.9	2,580	FDA-SB05	41/51	scattered
Groundwater	Volatiles (2)	Methylene Chloride	5	1	1	36-GW10	1/29	does not exceed standard
		1,2-Dichloroethene (total)	70	4	37	36-GW10IW	8/29	none exceed standard
		Trichloroethene	2.8	3	97	36-GW10IW	10/29	6 exceed standard, northern
		Tetrachloroethene	0.7	1	2	36-GW10IW	2/29	both exceed standard, northern
		1,1,2,2-Tetrachloroethane	0.17	3	10	36-GW10IW	6/29	northern, former ground scar area
	Semivolatiles	ND	--				0/17	
	Pesticides	4,4'-DDD	0.14	0.06	0.06	36-GW10	1/18	northern, during Round One only
	PCBs	ND	--				0/18	
	Total Metals	Iron	300	3.3	16,900	36-GW02	20/22	12 exceed standard, scattered
		Manganese	50	19.2	3,180	36-GW09	20/22	12 exceed standard, scattered
		Mercury	1.1	1.4	1.4	36-TW02	1/22	1 exceeds standard, southern

TABLE 3 (continued)
REMEDIAL INVESTIGATION RESULTS FOR SITE 36
OPERABLE UNIT NO. 6, SITES 36, 43, 44 and 54
ENGINEERING EVALUATION / COST ANALYSIS, CTO-0219
MCB CAMP LEJEUNE, NORTH CAROLINA

Media	Fraction	Detected Contaminants	Screening Criteria [5]	Site Contamination		Maximum Location	Detection Frequency	Distribution
				Min.	Max.			
Surface Water(3)	Volatiles	1,2-Dichloroethene (total)	2,240	7	7	36-SW02	1/7	UT, upgradient of open field
	Semivolatiles	ND	--				0/7	
	Pesticides	ND	--				0/7	
	PCBs	ND	--				0/7	
	Metals (4)	Copper	6.5	56.5	56.5	36-SW01	1/7	1 exceeds fresh standard, not background
		Iron	1,000	967	4840	36-SW03	7/7	3 exceed fresh standard and background
		Nickel	8.3	16.4	31.4	36-SW02	4/7	1 exceeds salt standard
Sediment	Volatiles	Tetrachloroethane	NA	4	4	36-SD04	1/13	near mouth of UT at BC
	Semivolatiles	Diethylphthalate	NA	330	2,135	36-SD05	3/13	UT and near mouth of UT
		Anthracene	85	46	46	36-SD04	1/13	does not exceed standard, UT
		Di-n-butylphthalate	NA	218	218	36-SD06	1/13	BC, adjacent to ground scar area
		Pyrene (PAH)	350	316	316	36-SD02	1/13	UT, does not exceed standard
	Pesticides	Aldrin	NA	0.9	0.9	36-SD01	1/13	UT, upgradient
		Dieldrin	NA	0.8	52	36-SD06	3/13	2 from BC, minimum from UT
		4,4'-DDE	2	32	1,200	36-SD05	9/13	9 exceed standard, higher in BC
		Endrin	0.02	6.6	6.6	36-SD02	1/13	UT, upgradient of open field
		4,4'-DDD	2	14	1,140	36-SD05	12/13	12 exceed standard
		Endosulfan Sulfate	NA	3	3	36-SD02	1/13	UT, upgradient of open field
		4,4'-DDT	1	3	46	36-SD05	11/13	11 exceed standard
		Endrin Ketone	NA	11	11	36-SD03	1/13	UT, adjacent to open field
		Endrin Aldehyde	NA	3.5	7.6	36-SD05	2/13	1 from BC, 1 from UT
		alpha-Chlordane	0.5	6.5	13	36-SD07	2/13	2 exceed standard, upgradient BC
	PCBs	ND	--				0/13	
	Metals (4)	Cadmium	5	1.4	8.7	36-SD02	2/15	1 exceeds standard and background, UT
		Lead	35	7.1	15,100	36-SD06	12/15	7 exceed standard, 1 exceeds background
		Mercury	0.15	0.2	0.7	36-SD04	3/4	3 exceed standard, 11 rejected
		Nickel	30	2.1	77.1	36-SD03	11/15	1 exceeds standard, from UT
		Zinc	120	25.3	140	36-SD02	5/5	1 exceeds standard, not background, UT

Notes:

- Concentrations are presented in ug/L for liquid and ug/kg for solids (ppb), metal concentrations for soils and sediments are presented in mg/kg (ppm).

(1) PCB contaminated soil was removed during the removal action that OHM conducted in 1997.
(2) An additional round of groundwater samples were collected from wells which exhibited concentrations of volatiles during the first round.
(3) Surface water detections were compared to appropriate NCWQS and NOAA screening values, based upon the observed percentage of saltwater at each sampling location.
(4) Total metals in surface water and sediment were compared to the range of positve detections in upgradient samples at MCB, Camp Lejeune.
(5) Screening criteria are provided as a reference point and are Region IX Residential PRGs for surface and subsurface soil, NCWQS for groundwater, and NOAA for surface water and sediment.

BC - Brinson Creek
NA - Not applicable
NCWQS - North Carolina Water Quality Standard
ND - Not detected
NOAA - National Oceanic and Atmospheric Administration
MCL - Federal Maximum Contaminant Level
PAH - Polynuclear aromatic hydrocarbon
UT - Unnamed Tributary

TABLE 4
REMEDIAL INVESTIGATION RESULTS FOR SITE 43
OPERABLE UNIT NO. 6, SITES 36, 43, 44 and 54
ENGINEERING EVALUATION / COST ANALYSIS, CTO-0219
MCB CAMP LEJEUNE, NORTH CAROLINA

Media	Fraction	Detected Contaminants	Screening Criteria [3]	Site Contamination		Maximum Location	Detection Frequency	Distribution
				Min.	Max.			
Surface Soil	Volatiles	ND	--				0/7	
	Semivolatiles	4-Methylphenol	310,000	120	120	DA1-SB02	1/28	northeastern portion of site
		2-Methylnapthalene	1,600,000	74	74	WA-SB01A	1/28	clearing adjacent to 43-GW01
		Acenaphthylene	NA	71	71	WA-SB01A	1/28	clearing adjacent to 43-GW01
		Acenaphthene (PAH)	3,700,000	45	2,100	WA-SB01A	3/28	clearing adjacent to 43-GW01
		Dibenzpfuran	290,000	35	870	WA-SB01A	2/28	clearing adjacent to 43-GW01
		Fluorene (PAH)	2,600,000	53	1,700	WA-SB01A	3/28	clearing adjacent to 43-GW01
		Phenanthrene (PAH)	NA	54	5,900	WA-SB01A	8/28	clearing adjacent to 43-GW01
		Anthracene (PAH)	22,000,000	44	820	WA-SB01A	3/28	clearing adjacent to 43-GW01
		Carbazole	NA	99	350	WA-SB01A	5/28	clearing adjacent to 43-GW01
		Fluoranthene (PAH)	2,300,000	49	60,000	WA-SB01A	10/28	clearing adjacent to 43-GW01
		Pyrene (PAH)	2,300,000	49	64,000	WA-SB01A	10/28	clearing adjacent to 43-GW01
		Butylbenzylphthalate	12,000,000	50	420	OA-SB03	3/28	maximum northeast of clearing
		B(a)anthracene (PAH)	620	51	40,000	WA-SB01A	9/28	clearing adjacent to 43-GW01
		Chrysene (PAH)	62,000	110	46,000	WA-SB01A	9/28	clearing adjacent to 43-GW01
		B(b)fluoranthene (PAH)	620	44	52,000	WA-SB01A	10/28	clearing adjacent to 43-GW01
		B(k)fluoranthene (PAH)	6,200	57	20,000	WA-SB01A	9/28	clearing adjacent to 43-GW01
		Benzo(a)pyrene (PAH)	62	79	39,000	WA-SB01A	9/28	clearing adjacent to 43-GW01
		I(1,2,3-cd)pyrene (PAH)	620	42	27,000	WA-SB01A	10/28	clearing adjacent to 43-GW01
		D(a,h)anthracene (PAH)	62	47	1,200	WA-SB01A	8/28	clearing adjacent to 43-GW01
		B(g,h,i)perylene (PAH)	NA	87	24,000	WA-SB01A	9/28	clearing adjacent to 43-GW01
	Pesticides	Heptachlor epoxide	53	2	2	WA-SB01A	1/7	clearing adjacent to 43-GW01
		4-4'-DDE	1,700	5.7	1,000	DA1-SB03	5/7	maximum northeast
		4-4'-DDD	2,400	3,000	3,000	DA1-SB03	1/7	northeastern portion of site
		4-4'-DDT	1,700	10	1,000	DA1-SB03	4/7	maximum northeast
		Endrin aldehyde	NA	5.4	5.4	DA2-SB03	1/7	north of clearing
	PCBs	ND	--	--	--	--	0/7	
	Metals	Cadmium	37	0.7	1.7	WA-SB02	2/21	separate areas
		Chromium	210	1.1	106	DA1-SB02	21/21	scattered

TABLE 4 (continued)
REMEDIAL INVESTIGATION RESULTS FOR SITE 43
OPERABLE UNIT NO. 6, SITES 36, 43, 44 and 54
ENGINEERING EVALUATION / COST ANALYSIS, CTO-0219
MCB CAMP LEJEUNE, NORTH CAROLINA

Media	Fraction	Detected Contaminants	Screening Criteria [3]	Site Contamination		Maximum Location	Detection Frequency	Distribution
				Min.	Max.			
Surface Soil (continued)	Metals (continued)	Copper	2,900	0.5	55.7	DA2-SB01	17/21	north of clearing
		Lead	400	4.3	246	DA2-SB01	20/21	scattered
		Manganese	1,800	2.8	189	DA2-SB01	21/21	scattered
		Mercury	23	0.1	0.5	DA1-SB02	3/21	drum areas
		Nickel	1,600	1.1	5	DA2-SB01	8/21	scattered
		Zinc	23,000	1.5	595	DA1-SB02	21/21	scattered
Subsurface Soil	Volatiles	ND	--				0/7	
	Semivolatiles	Phenanthrene (PAH)	NA	430	430	WA-SB02	1/20	clearing adjacent to 43-GW01
		Carbazole	NA	73	73	WA-SB02	1/20	clearing adjacent to 43-GW01
		Fluoranthene (PAH)	2,300,000	850	850	WA-SB02	1/20	clearing adjacent to 43-GW01
		Pyrene (PAH)	2,300,000	1,800	1,800	WA-SB02	1/20	clearing adjacent to 43-GW01
		Butylbenzylphtalate	12,000,000	39	440	OA-SB03	2/20	north of clearing
		B(a)anthracene (PAH)	620	390	390	WA-SB02	1/20	clearing adjacent to 43-GW01
		Chrysene	62,000	740	740	WA-SB02	1/20	clearing adjacent to 43-GW01
		B(b)fluoranthene (PAH)	620	780	780	WA-SB02	1/20	clearing adjacent to 43-GW01
		B(k)fluoranthene (PAH)	6,200	340	340	WA-SB02	1/20	clearing adjacent to 43-GW01
		Benzo(a)pyrene (PAH)	62	570	570	WA-SB02	1/20	clearing adjacent to 43-GW01
		I(1,2,3-cd)pyrene (PAH)	620	890	890	WA-SB02	1/20	clearing adjacent to 43-GW01
		B(g,h,i)perylene (PAH)	NA	790	790	WA-SB02	1/20	clearing adjacent to 43-GW01
	Pesticides	4,4'-DDE	1,700	9	9	DA1-SB03	1/7	northeastern portion or site
		4,4'-DDD	2,400	1,200	1,200	DA1-SB03	1/7	northeastern portion or site
		4,4'-DDT	1,700	45	45	DA1-SB03	1/7	northeastern portion or site
	PCBs	ND	--				0/7	
	Metals	Copper	2,900	0.4	3.6	OA-SB01	6/20	north of clearing
Groundwater	Volatiles	ND	--				0/10	
	Semivolatiles	4-Methylphenol	3.5	2	2	43-TW04	1/10	north near SHC and EC
	Pesticides	ND	--				0/10	
	PCBs	ND	--				0/6	
	Total Metals	Iron	300	109	33,800	43-TW04	10/10	8 exceed standard, scattered
		Manganese	50	4.4	107	43-TW04	10/10	2 exceed standard, central and north

TABLE 4 (continued)
REMEDIAL INVESTIGATION RESULTS FOR SITE 43
OPERABLE UNIT NO. 6, SITES 36, 43, 44 and 54
ENGINEERING EVALUATION / COST ANALYSIS, CTO-0219
MCB CAMP LEJEUNE, NORTH CAROLINA

Media	Fraction	Detected Contaminants	Screening Criteria [3]	Site Contamination		Maximum Location	Detection Frequency	Distribution
				Min.	Max.			
Surface Water (1)	Volatiles	1,2-Dichloroethene (total)	2,240	2	2	EC-SW02	2/6	neither exceed standard, EC
	Semivolatiles	ND	--				0/6	
	Pesticides	4,4-DDE	0.14	0.1	0.1	EC-SW01	2/6	do not exceed standard, 1 EC, 1 SHC
		4,4-DDD	0.025	0.1	0.6	EC-SW01	3/6	3 exceed standard, 1 EC, 2 SHC
	PCBs	ND	--				0/6	
	Metals (2)	Copper	2.9	1.8	3.2	EC-SW02	3/6	1 exceed standard, not background
Sediment	Volatiles	Carbon Disulfide	NA	3	26	EC-SD02	3/12	2 from EC and 1 from SHC
	Semivolatiles	4-Methylphenol	NA	210	210	SHC-SD03	1/12	adjacent to study area, SHC
		Pyrene (PAH)	350	200	200	EC-SD02	1/12	does not exceed standard, EC
		Benzo(a)pyrene (PAH)	400	290	1,900	SHC-SD02	4/12	3 exceed standard, 2 EC and 1 SHC
	Pesticides	4,4'-DDE	2	12	8,900	SHC-SD04	10/12	10 exceed standard, scattered
		Endrin	NA	12	16	EC-SD01	2/11	1 detection EC and 1 SHC
		4,4'-DDD	2	5.6	37,000	SHC-SD04	11/12	11 exceed standard, scattered
		4,4'-DDT	1	9.3	180	EC-SD01	6/12	6 exceed standard, scattered
		alpha-Chlordane	0.5	7.2	49	SHC-SD03	8/12	8 exceed standard, scattered
		gamma-Chlordane	0.5	9.6	74	SHC-SD03	9/12	9 exceed standard, scattered
	PCBs	ND	--				0/9	
	Metals (2)	Lead	35	6.1	206	SHC-SD03	12/12	7 exceed standard, none exceed background
		Mercury	0.15	0.4	0.7	EC-SD01	2/12	2 exceed standard
		Silver	1	1.9	2.8	EC-SD02	2/12	2 exceed standard, neither exceed BB
		Zinc	120	1.5	338	EC-SD01	12/12	4 exceed standard, none exceed background

Notes:

- Concentrations are presented in µg/L for liquid and µg/kg for solids (ppb), metal concentrations for soils and sediments are presented in mg/kg (ppm).
(1) Positive contaminant detections in surface water were compared to appropriate NCWQS and NOAA saltwater screening values.
(2) Total metals in surface water and sediment were also compared to the range of positive detections in upgradient samples at MCB, Camp Lejeune.
(3) Screening criteria are provided as a reference point and are Region IX Residential PRGs for surface and subsurface soil, NCWQS for groundwater, and NOAA for surface water and sediment.

ARAR - Applicable or Relevant and Appropriate Requirements
BC - Brinson Creek
NCWQS - North Carolina Water Quality Standard
EC - Edwards Creek
NA - Not applicable
ND - Not detected
NOAA - National Oceanic and Atmospheric Administration

TABLE 5
REMOVAL ACTION ALTERNATIVES SUMMARY TABLE
OPERABLE UNIT NO. 6, SITES 36, 43, 44 and 54
ENGINEERING EVALUATION / COST ANALYSIS, CTO-0219
MCB CAMP LEJEUNE, NORTH CAROLINA

Alternative	Media	Description / Components	Land Use Controls Needed	Screening Criteria	Cost
Site 36					
36S RAA 1) No Action	Soil	No remedial action or institutional controls	None	NA	$0
36S RAA 2) Capping and Institutional Controls for Lead Contaminated Areas [1]	Soil	Soil cover over contaminated areas exceeding cleanup goals; site restoration; designate lead impacted soil areas for future land use restrictions	Excavation Restrictions	Four areas of elevated PAH and pesticde contaminated soil	$188,000
36S RAA 3) Excavation and Off-Site Disposal and Institutional Controls for Lead Contaminated Areas [1]	Soil	Excavate all soils above cleanup levels; disposal of waste in appropriate landfills; site restoration; designate lead impacted soil areas for future land use restrictions	Excavation Restrictions	Four areas of elevated PAH and pesticde contaminated soil to a depht of 2 feet	$201,000
Site 43 [2]					
43S RAA 1) No Action	Soil	No remedial action or institutional controls	None	NA	$0
43S RAA 2) Capping and Institutional Controls	Soil	Soil cover over contaminated areas exceeding cleanup goals; site restoration; institutional controls including an intrusive activity boundary for the former site-wide dump.	Excavation Restrictions	Area of elevated PAH contaminated soil	$170,000
43S RAA 3) Excavation and Off-Site Disposal and Institutional Controls	Soil	Excavate all soils above cleanup levels; disposal of waste in appropriate landfills; site restoration; institutional controls including an intrusive activity boundary for the former site-wide dump.	Excavation Restrictions	Area of elevated PAH contaminated soil to a depht of 3 feet	$119,000

(1) Land use controls in place until remedial cleanup goals are achieved

(2) Note that institutional controls (i.e.,Excavation Restrictions) will be in effect at Site 43 since it was a former disposal area

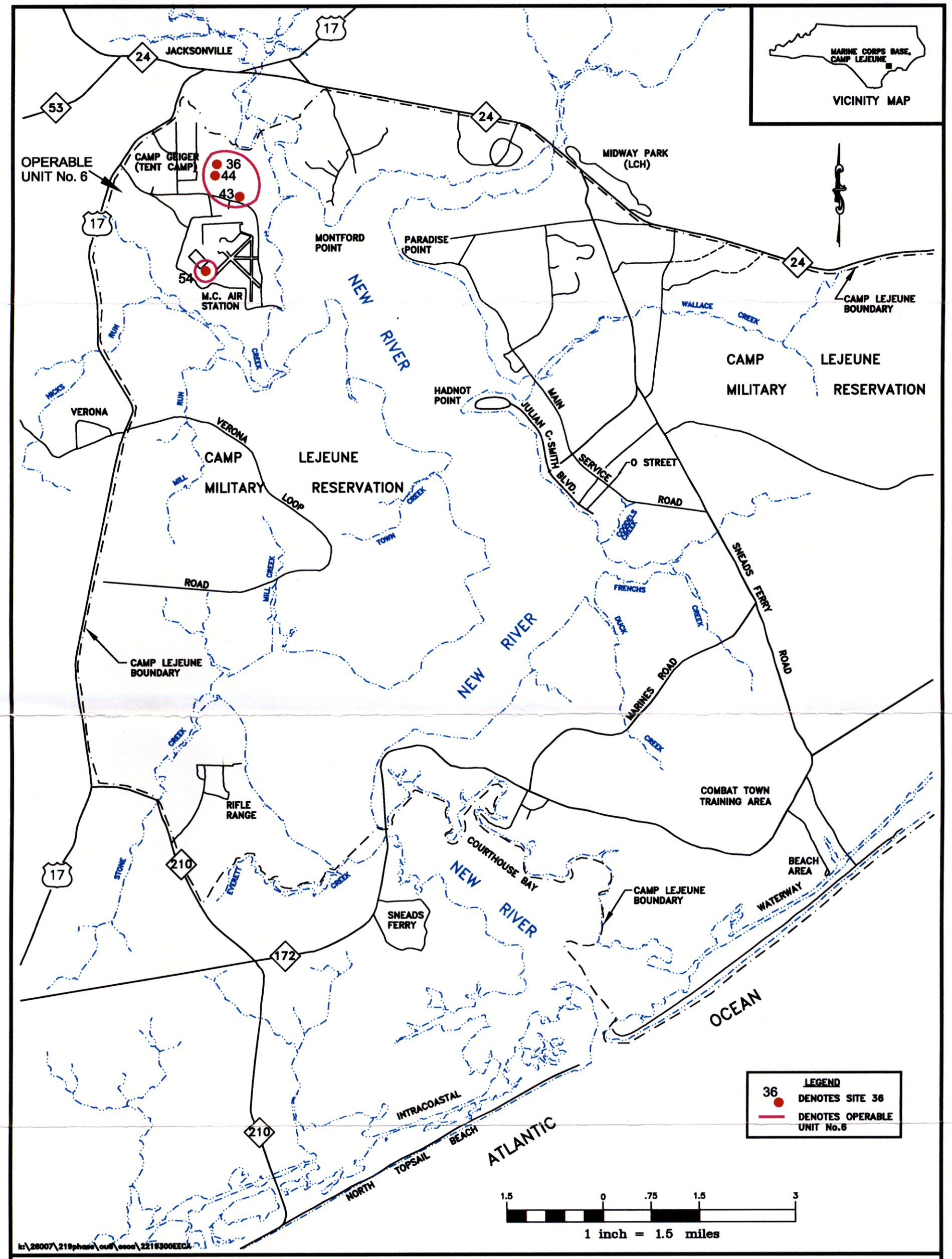
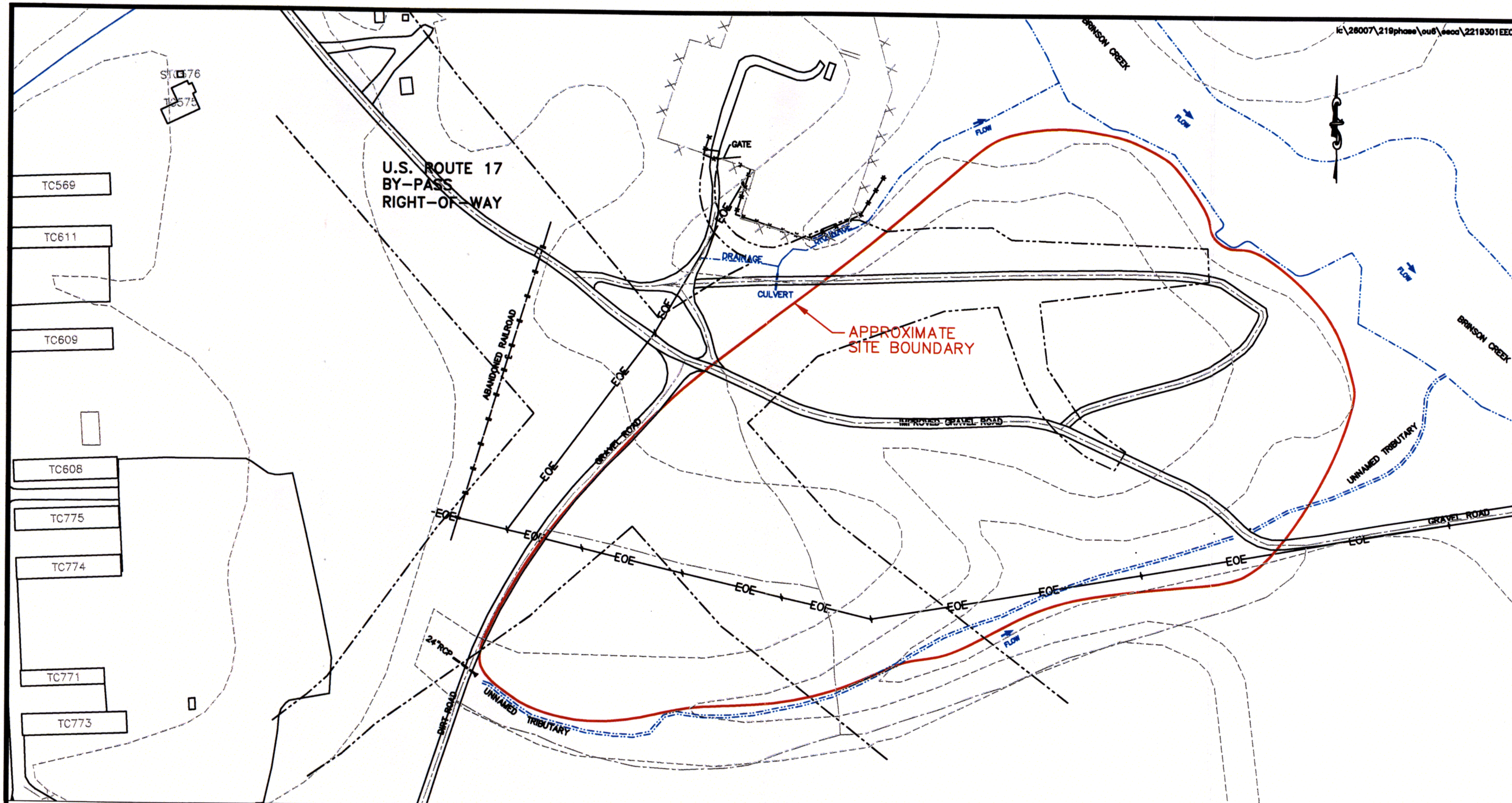


FIGURE 1
SITE LOCATION MAP
ENGINEERING EVALUATION / COST ANALYSIS
OPERABLE UNIT No. 6 – SITES 36, 43, 44 AND 54
CTO – 0219

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA



200 0 100 200
1 inch = 200 ft.

Baker
Baker Environmental Inc.

LEGEND

FLOW — DIRECTION OF SURFACE WATER FLOW
EOE — OVERHEAD ELECTRIC LINE & UTILITY POLE
FENCE
ASPHALT ROAD
GRAVEL ROAD
STREAM
US 17 JACKSONVILLE BYPASS EASEMENT LIMITS

SOURCE: LANTDIV, MARCH 2000

FIGURE 2
SITE 36 FEATURES MAP
ENGINEERING EVALUATION / COST ANALYSIS
OPERABLE UNIT NO. 6 – SITES 36, 43, 44 AND 54
CTO – 0219
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

k:\28007\219phase\ou6\eeca\2219302EECA

FLOW

FLOW

STRAWHORN CREEK

DRAINAGE DITCH

APPROXIMATE SITE BOUNDARY

SOIL PATH

MARSH

GRAVEL ROAD

ABANDONED SEWAGE DISPOSAL FACILITY

AGAN STREET

EOE

SEWAGE PUMP/LIFT STATION

GRAVEL ROAD

SOIL PATH

36"RCP

FLOW

DRAINAGE DITCH

MARSH

FLOW

STRAWHORN CREEK

FLOW

AGAN STREET

DAYCARE/ MINISCHOOL

LEGEND

- FLOW — DIRECTION OF SURFACE WATER FLOW
- MARSH
- EOE — OVERHEAD ELECTRIC LINE & UTILITY POLE
- FENCE
- ASPHALT ROAD
- GRAVEL ROAD OR SOIL PATH
- EDGE OF CREEK, DRAINAGE DITCH OR MARSH
- TREE LINE
- STRUCTURE

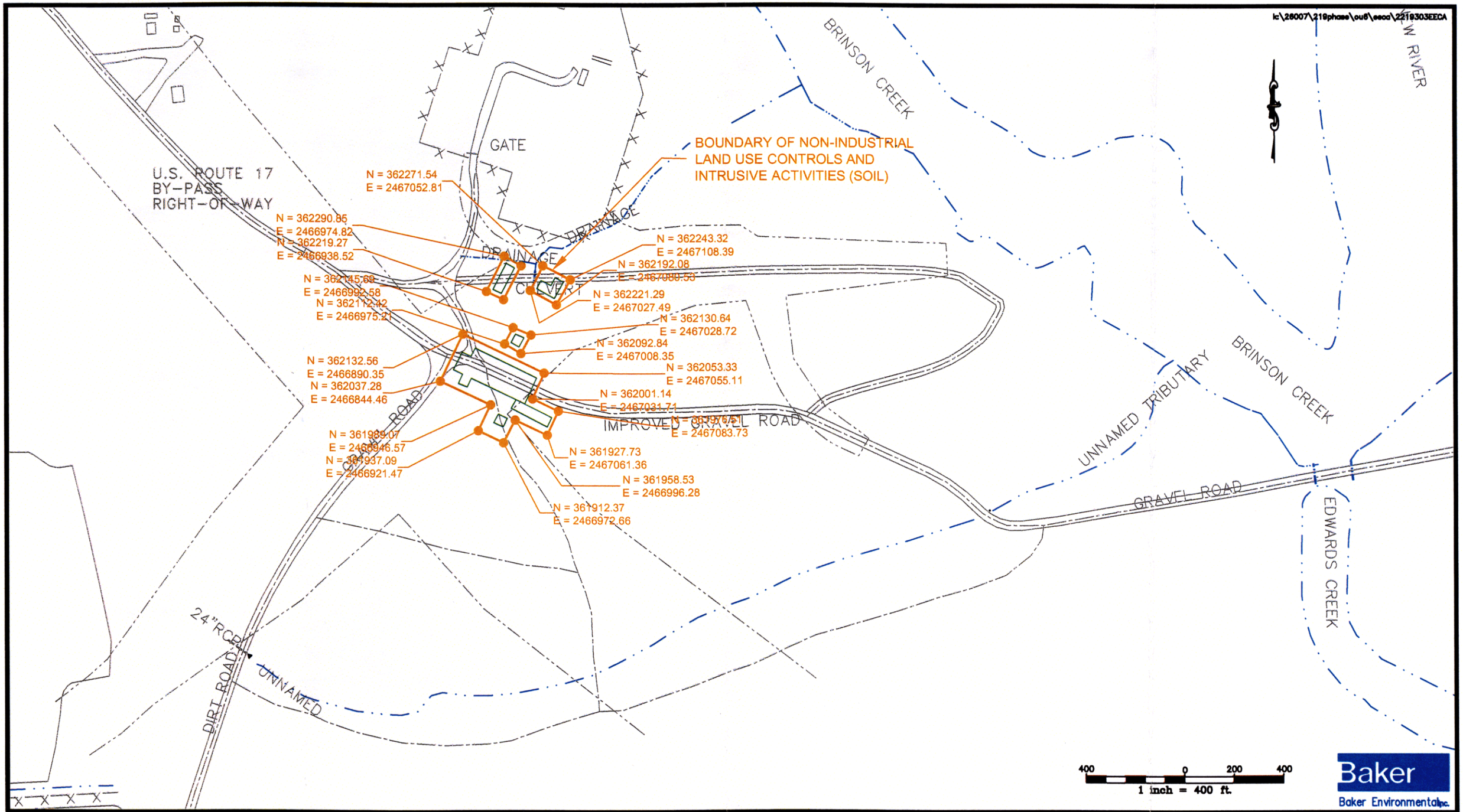
120 0 60 120

1 inch = 120 ft.

Baker

FIGURE 3
SITE 43 FEATURES MAP
ENGINEERING EVALUATION / COST ANALYSIS
OPERABLE UNIT NO. 6 – SITES 36, 43, 44 AND 54
CTO – 0219
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

lc:\26007\219phase\ou6\eeca\2219303EECA



LEGEND:

BOUNDARY OF FORMER SOIL CONTAMINATION

BOUNDARY OF NON-INDUSTRIAL LAND USE CONTROLS AND INTRUSIVE ACTIVITIES (SOIL)

SOURCE: MCB, CAMP LEJEUNE, MARCH 2000

FIGURE 4
SITE 36 – BOUNDARY OF FORMER SOIL CONTAMINATION
ENGINEERING EVALUATION / COST ANALYSIS
OPERABLE UNIT NO. 6 – SITES 36, 43, 44 AND 54
CTO – 0219

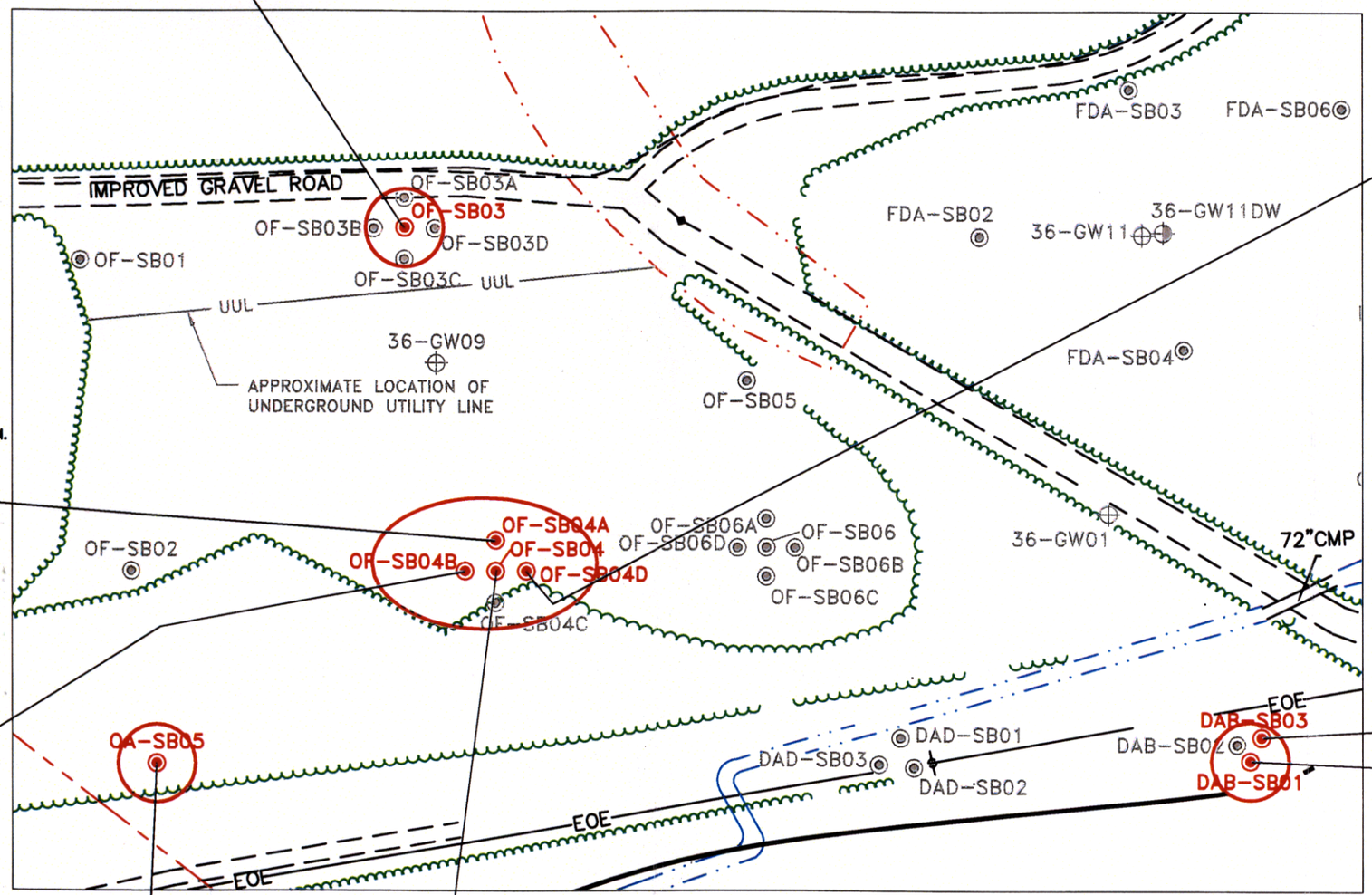
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

REGION IX PRELIMINARY REMEDIATION GOALS (PRGs) - RESIDENTIAL

SEMIVOLATILE ORGANIC COMPOUNDS	REGION IX PRGs – RESIDENTIAL
NAPHTHALENE	56,000
2–METHYLNAPHTHALENE	NE
ACENAPHTHENE	3,700,000
DIBENZOFURAN	290,000
DIETHYLPHTHALATE	49,000,000
FLUORENE	2,600,000
N–NITROSO–DI–N–PROPYLAMINE	69
PHENANTHRENE	NE
ANTHRACENE	22,000,000
CARBAZOLE	24,000
FLUORANTHENE	2,300,000
PYRENE	2,300,000
BENZO(A)ANTHRACENE	620
CHRYSENE	62,000
BIS(2–ETHYLHEXYL)PHTHALATE	NE
BENZO(B)FLUORANTHENE	620
BENZO(K)FLUORANTHENE	6,200
BENZO(A)PYRENE	62
INDENO(1,2,3–CD)PYRENE	620
BUTYLBENZYLPHTHALATE	12,000,000
DIBENZO(A,H)ANTHRACENE	62
BENZO(G,H,I,)PERYLENE	NE
PESTICIDES	**REGION IX PRGs – RESIDENTIAL**
ALDRIN	29
DIELDRIN	30
4,4'–DDE*	1,700
4,4'–DDD*	2,400
4,4'–DDT*	1,700
ENDRIN KETONE	1,800
ALPHA–CHLORDANE	1,600

NOTES:
1. CONCENTRATIONS PRESENTED IN MICROGRAMS PER KILOGRAM.
2. EXCEED REGION IX PRG – RESIDENTIAL IN RED.

LOCATION	36–OF–SB03–00
DATE SAMPLED	02/21/95
PESTICIDES (ug/kg)	
ALDRIN	1400
DIELDRIN	16000
4,4'–DDE	11 J
4,4'–DDD	16 J
4,4'–DDT	2.3 J
ENDRIN KETONE	15 J
ALPHA–CHLORDANE	2.3 J



LOCATION	36–OF–SB04D–00
DATE SAMPLED	05/31/96
SEMIVOLATILE (ug/kg)	
DIETHYLPHTHALATE	160 J
PHENANTHRENE	76 J
FLUORANTHENE	160 J
PYRENE	170 J
BENZO(A)ANTHRACENE	120 J
CHRYSENE	160 J
BENZO(B)FLUORANTHENE	180 J
BENZO(K)FLUORANTHENE	80 J
BENZO(A)PYRENE	110 J
INDENO(1,2,3–CD)PYRENE	71 J
BENZO(G,H,I)PERLYENE	70 J

LOCATION	36–OF–SB04A–00
DATE SAMPLED	05/31/96
SEMIVOLATILE (ug/kg)	
ACENAPHTHENE	150 J
DIBENZOFURAN	100 J
FLUORENE	100 J
PHENANTHRENE	2800
ANTHRACENE	740
FLUORANTHENE	3400
PYRENE	3800
BUTYLBENZYLPHTHALATE	99 J
BENZO(A)ANTHRACENE	2100
CHRYSENE	1900
BENZO(B)FLUORANTHENE	3000
BENZO(K)FLUORANTHENE	990
BENZO(A)PYRENE	1900
INDENO(1,2,3–CD)PYRENE	1300
DIBENZO(A,H)ANTHRACENE	360 J
BENZO(G,H,I)PERLYENE	980

LOCATION	36–DAB–SB03–00
DATE SAMPLED	02/24/95
SEMIVOLATILES (ug/kg)	
N–NITROSO–DI–N–PROPYLAMINE	320 J
PHENANTHRENE	68 J
FLUORANTHENE	88 J
PYRENE	120 J
BENZO(A)ANTHRACENE	46 J
CHRYSENE	51 J
INDENO(1,2,3–CD)PYRENE	58 J
PESTICIDES/PCBs (ug/kg)	
4,4'–DDE	55 J
4,4'–DDD	6.1 J
4,4'–DDT	17

LOCATION	36–OF–SB04B–00
DATE SAMPLED	05/31/96
SEMIVOLATILE (ug/kg)	
NAPHTHALENE	820 J
2–METHYLNAPHTHALENE	1000 J
ACENAPHTHENE	4200
DIBENZOFURAN	2400
FLUORENE	2200
PHENANTHRENE	29000
ANTHRACENE	8400
CARBAZOLE	2600
FLUORANTHENE	52000
PYRENE	58000
BENZO(A)ANTHRACENE	39000
CHRYSENE	44000
BENZO(B)FLUORANTHENE	64000
BENZO(K)FLUORANTHENE	12000
BENZO(A)PYRENE	43000
INDENO(1,2,3–CD)PYRENE	35000
DIBENZO(A,H)ANTHRACENE	5700
BENZO(G,H,I)PERLYENE	31000

LOCATION	36–OA–SB05–00
DATE SAMPLED	02/28/95
PESTICIDES/PCBs (ug/kg)	
HEPTACHLOR EPOXIDE	24 J
DIELDRIN	160 J
4,4'–DDE	1000
4,4'–DDD	230 J
4,4'–DDT	420
ALPHA–CHLORDANE	980
GAMMA–CHLORDANE	840

LOCATION	36–OF–SB04–00
DATE SAMPLED	02/22/95
SEMIVOLATILES (ug/kg)	
NAPHTHALENE	120 J
2–METHYLNAPHTHALENE	54 J
ACENAPHTHENE	330 J
DIBENZOFURAN	150 J
FLUORENE	200 J
PHENANTHRENE	2500
ANTHRACENE	780
CARBAZOLE	240 J
FLUORANTHENE	5500
PYRENE	11000 J
BENZO(A)ANTHRACENE	3900 J
CHRYSENE	4600 J
BENZO(B)FLUORANTHENE	3600
BENZO(K)FLUORANTHENE	1500
BENZO(A)PYRENE	3300
INDENO(1,2,3–CD)PYRENE	2700
DIBENZO(A,H)ANTHRACENE	720
BENZO(G,H,I)PERYLENE	2400
PESTICIDES (ug/kg)	
DIELDRIN	47 J

LOCATION	36–DAB–SB01–00
DATE SAMPLED	02/24/95
SEMIVOLATILES (ug/kg)	
PYRENE	41 J
BENZO(K)FLUORANTHENE	39 J
PESTICIDES/PCBs (ug/kg)	
4,4'–DDE	960
4,4'–DDD	120 J
4,4'–DDT	3300 J

80 0 40 80
1 inch = 80 ft.

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LEGEND

- SHALLOW MONITORING WELL
- INTERMEDIATE MONITORING WELL
- DEEP MONITORING WELL
- SOIL BORING LOCATION (SURFACE SAMPLE)
- –UUL– UNDERGROUND UTILITY LINE
- AREA OF CONCERN
- GRAVEL ROAD
- DRAINAGE DITCH
- TREE LINE
- US 17 JACKSONVILLE BYPASS EASEMENT LIMITS

FIGURE 5
SITE 36 – PAH AND PESTICIDE EXCEEDENCES ENGINEERING EVALUATION / COST ANALYSIS OPERABLE UNIT NO. 6 – SITES 36, 43, 44 AND 54 CTO – 0219

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

LOCATION 43-WA-SB01A2-00	
DATE SAMPLED	05/01/95
SEMIVOLATILE (ug/kg)	
ACENAPHTHENE	45 J
FLUORENE	53 J
PHENANTHRENE	1000
CARBAZOLE	260 J
FLUORANTHENE	2200
PYRENE	2100
BUTYLBENZYLPHTHALATE	50 J
BENZO(A)ANTHRACENE	980
CHRYSENE	1500
BENZO(B)FLUORANTHENE	2300
BENZO(K)FLUORANTHENE	700
BENZO(A)PYRENE	1300
INDENO(1,2,3-CD)PYRENE	1300
DIBENZO(A,H)ANTHRACENE	280 J
BENZO(G,H,I)PERYLENE	1200

LOCATION 43-WA-SB01A1-00	
DATE SAMPLED	05/01/95
SEMIVOLATILE (ug/kg)	
PHENANTHRENE	610
CARBAZOLE	120 J
FLUORANTHENE	1500
PYRENE	1200
BENZO(A)ANTHRACENE	560
CHRYSENE	890
BENZO(B)FLUORANTHENE	1100
BENZO(K)FLUORANTHENE	420
BENZO(A)PYRENE	690
INDENO(1,2,3-CD)PYRENE	590
DIBENZO(A,H)ANTHRACENE	110 J
BENZO(G,H,I)PERYLENE	560

LOCATION 43-WA-SB01B-00	
DATE SAMPLED	03/14/95
SEMIVOLATILE (ug/kg)	
FLUORANTHENE	130 J
PYRENE	150 J
BENZO(A)ANTHRACENE	67 J
CHRYSENE	120 J
BENZO(B)FLUORANTHENE	600
BENZO(K)FLUORANTHENE	280 J
BENZO(A)PYRENE	770
INDENO(1,2,3-CD)PYRENE	590
DIBENZO(A,H)ANTHRACENE	110 J
BENZO(G,H,I)PERYLENE	380 J

LOCATION 43-WA-SB01C-00	
DATE SAMPLED	03/14/95
SEMIVOLATILE (ug/kg)	
PHENANTHRENE	54 J
FLUORANTHENE	350
PYRENE	430
BENZO(A)ANTHRACENE	260 J
CHRYSENE	340 J
BENZO(B)FLUORANTHENE	500
BENZO(K)FLUORANTHENE	200 J
BENZO(A)PYRENE	480
INDENO(1,2,3-CD)PYRENE	550
DIBENZO(A,H)ANTHRACENE	47 J
BENZO(G,H,I)PERYLENE	480

LOCATION 43-WA-SB01-00	
DATE SAMPLED	02/28/95
SEMIVOLATILE (ug/kg)	
PHENANTHRENE	260 J
FLUORANTHENE	530
PYRENE	470
BENZO(A)ANTHRACENE	190 J
CHRYSENE	370 J
BENZO(B)FLUORANTHENE	410
BENZO(K)FLUORANTHENE	200 J
BENZO(A)PYRENE	260 J
INDENO(1,2,3-CD)PYRENE	270 J
DIBENZO(A,H)ANTHRACENE	73 J
BENZO(G,H,I)PERYLENE	280 J

LOCATION 43-WA-SB02-01	
DATE SAMPLED	02/28/95
SEMIVOLATILE (ug/kg)	
PHENANTHRENE	430
CARBAZOLE	73 J
FLUORANTHENE	850
PYRENE	1800 J
BUTYLBENZYLPHTHALATE	39 J
BENZO(A)ANTHRACENE	390 J
CHRYSENE	740 J
BENZO(B)FLUORANTHENE	780
BENZO(K)FLUORANTHENE	340 J
BENZO(A)PYRENE	570
INDENO(1,2,3-CD)PYRENE	890
DIBENZO(A,H)ANTHRACENE	170 J
BENZO(G,H,I)PERYLENE	790

LOCATION 43-WA-SB01A-00	
DATE SAMPLED	03/14/95
SEMIVOLATILE (ug/kg)	
2-METHYLNAPHTHALENE	74 J
ACENAPHTHENE	2900
DIBENZOFURAN	870
FLUORENE	1700
PHENANTHRENE	5900 J
ANTHRACENE	820
CARBAZOLE	350 J
FLUORANTHENE	60000
PYRENE	64000
BENZO(A)ANTHRACENE	41000
CHRYSENE	46000
BENZO(B)FLUORANTHENE	52000
BENZO(K)FLUORANTHENE	20000
BENZO(A)PYRENE	39000
INDENO(1,2,3-CD)PYRENE	27000
DIBENZO(A,H)ANTHRACENE	1200
BENZO(G,H,I)PERYLENE	24000

LOCATION 43-WA-SB01A3-00	
DATE SAMPLED	05/01/95
SEMIVOLATILE (ug/kg)	
ACENAPHTHYLENE	71 J
ACENAPHTHENE	63 J
DIBENZOFURAN	35 J
FLUORENE	59 J
PHENANTHRENE	1300
ANTHRACENE	210 J
CARBAZOLE	300 J
FLUORANTHENE	6400
PYRENE	6500
BUTYLBENZYLPHTHALATE	100 J
BENZO(A)ANTHRACENE	3200
CHRYSENE	4500
BENZO(B)FLUORANTHENE	6800
BENZO(K)FLUORANTHENE	1300
BENZO(A)PYRENE	4700
INDENO(1,2,3-CD)PYRENE	3600
DIBENZO(A,H)ANTHRACENE	710
BENZO(G,H,I)PERYLENE	3400

LOCATION 43-GW01DW-00	
DATE SAMPLED	02/28/95
SEMIVOLATILE (ug/kg)	
PHENANTHRENE	720
ANTHRACENE	44 J
CARBAZOLE	99 J
FLUORANTHENE	1400
PYRENE	1100
BENZO(A)ANTHRACENE	570
CHRYSENE	1000
BENZO(B)FLUORANTHENE	1500
BENZO(K)FLUORANTHENE	580
BENZO(A)PYRENE	760
INDENO(1,2,3-CD)PYRENE	500
DIBENZO(A,H)ANTHRACENE	110 J
BENZO(G,H,I)PERYLENE	420

LOCATION 43-WA-SB01A4-00	
DATE SAMPLED	05/01/95
SEMIVOLATILE (ug/kg)	
PHENANTHRENE	67 J
FLUORANTHENE	230 J
PYRENE	170 J
BENZO(A)ANTHRACENE	51 J
CHRYSENE	110 J
BENZO(B)FLUORANTHENE	170 J
BENZO(K)FLUORANTHENE	57 J
BENZO(A)PYRENE	79 J
INDENO(1,2,3-CD)PYRENE	90 J
BENZO(G,H,I)PERYLENE	87 J

WA-SB01C
WA-SB01B
WA-SB01A1
WA-SB01A2
WA-SB01A
WA-SB01A4
WA-SB01A3
WA-SB01
WA-SB02 (1'-3')
43-GW01DW
OA-SB03
WA-SB03
APPROXIMATE SITE BOUNDARY
AREA OF CONCERN
GRAVEL ROAD

LEGEND

- 43-GW01DW — PILOT TEST BORING FOR DEEP MONITORING WELL
- OA-SB01 — SOIL BORING LOCATION
- WA-SB01A — SURFACE SOIL SAMPLE LOCATION
- GRAVEL ROAD OR SOIL PATH
- TREE LINE
- AREA OF CONCERN

RESIDENTIAL REGION IX PRELIMINARY REMEDIATION GOALS (PRGs)

SEMI VOLATILE ORGANIC COMPOUNDS	REGION IX PRGS-RESIDENTIAL
2-METHYLNAPHTHALENE	NE
ACENAPHTHENE	3,700,000
ACENAPHTHYLENE	NE
DIBENZOFURAN	290,000
CARBAZOLE	24,000
FLUORENE	2,600,000
PHENANTHRENE	NE
FLUORANTHENE	2,300,000
PYRENE	2,300,000
BUTYLBENZYLPHTHALATE	12,000,000
BENZO(A)ANTHRACENE	620
CHRYSENE	62,000
BENZO(B)FLUORANTHENE	620
BENZO(K)FLUORANTHENE	6,200
BENZO(A)PYRENE	62
INDENO(1,2,3-CD)PYRENE	620
BENZO(G,H,I)PERYLENE	NE
DIBENZO(A,H)ANTHRACENE	62

NOTE:
1. CONCENTRATIONS PRESENTED IN MICROGRAMS PER KILOGRAM.
2. EXCEEDANCE OF REGION IX RESIDENTIAL PRG SHOWN IN RED.

30 0 15 30
1 inch = 30 ft.

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FIGURE 6
SITE 43 - PAH EXCEEDENCES
ENGINEERING EVALUATION / COST ANALYSIS
OPERABLE UNIT NO. 6 - SITES 36, 43, 44 AND 54
CTO - 0219
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

OA-SB04

EXCAVATE TO DEPTH OF 2 FEET

IMPROVED GRAVEL ROAD

OF-SB03A
OF-SB03
OF-SB03B
OF-SB03D
OF-SB03C

OF-SB01

UUL

APPROXIMATE LOCATION OF UNDERGROUND UTILITY LINE

OA-SB03

36-GW09

OF-SB05

EXCAVATE TO DEPTH OF 2 FEET

OF-SB02

OF-SB04A
OF-SB04
OF-SB04B
OF-SB04D
OF-SB04C

OF-SB06A
OF-SB06D
OF-SB06
OF-SB06B
OF-SB06C

EXCAVATE TO DEPTH OF 2 FEET

OA-SB05

FDA-SB03

FDA-SB06

OA-SB08
SB03

FDA-SB02

36-GW11DW

36-GW11

FDA-SB01

36-GW02

FDA-SB05

FDA-SB04

FLOW

UNNAMED TRIBUTAR

OA-SB07

36-GW01

72"CMP

EOE

DAD-SB01
DAD-SB03
DAD-SB02

DAB-SB03
DAB-SB02
DAB-SB01

EXCAVATE TO DEPTH OF 2 FEET

EOE

EOE

EOE

80 0 40 80
1 inch = 80 ft.

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NOTE:
SOIL BORINGS IN RED EXCEED REGION IX RESIDENTIAL PRGs.
SAMPLE LOCATIONS IN BLUE EXCEED USEPA OSWER DIRECTIVE FOR LEAD (400 ppm).

LEGEND

- SHALLOW MONITORING WELL
- INTERMEDIATE MONITORING WELL
- DEEP MONITORING WELL
- SOIL BORING LOCATION
- UUL UNDERGROUND UTILITY LINE
- GRAVEL ROAD
- DRAINAGE DITCH
- TREE LINE
- US 17 JACKSONVILLE BYPASS EASEMENT LIMITS
- INSTITUTIONAL CONTROL BOUNDARY FOR LEAD

FIGURE 7
36S RAA 3: EXCAVATION AND OFF-SITE DISPOSAL AND INSTITUTIONAL CONTROLS FOR LEAD ENGINEERING EVALUATION / COST ANALYSIS OPERABLE UNIT NO. 6 – SITES 36, 43, 44 AND 54
CTO – 0219
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

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EXCAVATE TO DEPTH OF 3 FEET

OA-SB03

WA-SB01C

WA-SB01B

WA-SB01A1

WA-SB01A2

WA-SB01A

WA-SB01

WA-SB01A4

WA-SB02

WA-SB01A3

43-GW01DW

WA-SB03

APPROXIMATE SITE BOUNDARY

GRAVEL ROAD

LEGEND

43-GW01DW — PILOT TEST BORING FOR DEEP MONITORING WELL

OA-SB01 — SOIL BORING LOCATION

WA-SB01A — SURFACE SOIL SAMPLE LOCATION

GRAVEL ROAD OR SOIL PATH

TREE LINE

30 0 15 30

1 inch = 30 ft.

Baker

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FIGURE 8

43S RAA 3: EXCAVATION AND OFF-SITE DISPOSAL
ENGINEERING EVALUATION / COST ANALYSIS
OPERABLE UNIT NO. 6 - SITES 36, 43, 44 AND 54
CTO - 0219

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA